REMARKS

The Examiner's Action mailed on March 12, 2008, has been received and its contents carefully considered. Additionally attached to this Amendment is a Petition for a one-month Extension of Time extending the response period to July 14, 2008.

In this Amendment, Applicants have amended claims 1, 3 and 5, canceled claims 2 and 4, and added claims 6 and 7. Claims 1 and 3 are the independent claims, and claims 1, 3 and 5-7 are pending in the application. For at least the following reasons, it is submitted that this application is in condition for allowance.

The Examiner has objected to claim 5 for informalities. In response, claim 5 has been amended to correct the matter specifically indicated by the Examiner, effectively rendering the objection moot.

The Examiner has rejected claims 1 and 2 as being anticipated by *Ryu* (US 2004/0119076). Claim 2 has been canceled, rendering the rejection thereto moot. Claim 1 has been amended to incorporate the subject matter of claim 2. Thus, Applicant will treat the rejection of claim 2 as pertaining to claim 1. Claim 1 is not anticipated by the cited reference for at least the following reasons.

It is well settled that a reference may anticipate a claim within the purview of 35 U.S.C. § 102 only if all the features and all the relationships recited in the claim are taught by the referenced structure either by clear disclosure or under the principle of inherency.

Claim 1 is directed to a semiconductor device that has an epitaxial layer and an impurity region. The epitaxial layer has a first conductivity. The impurity region is formed by doping a surface portion of the epitaxial layer with an impurity of a second

conductivity. The impurity region has a profile such that a near surface thereof has a relatively low second-conductivity impurity concentration and a deep portion thereof has a relatively high second-conductivity impurity concentration. A second-conductivity impurity concentration in an outermost surface portion of the impurity region is controlled to be lower than a first-conductivity impurity concentration in the epitaxial layer. Because the concentration of the epitaxial layer is higher than the concentration of the outermost surface portion, the first conductivity appears in the outermost surface portion of the impurity region (see the specification, paragraph [0024], line 6). Further, because the impurity region has a relatively low impurity concentration at the outermost surface portion, carriers moving in the channel region (i.e., the outermost surface portion) are less liable to be scattered (see the specification, paragraph [0023], line 10). These features of the invention are not disclosed (or suggested) by the cited reference.

Ryu is directed to a semiconductor device that includes, *inter alia*, an N-type silicon carbide region 26 and a p-well 20 (see *Ryu*, Figure 5D). The Examiner equates the p-well 20 disclosed by *Ryu* with the impurity region recited in claim 1.

However, there is no disclosure or suggestion that an impurity concentration at outermost surface portion of *Ryu's* p-well 20 is lower than an impurity concentration of *Ryu's* region 26. The Examiner asserts that the concentration of *Ryu's* p-well 20 is lower than that of *Ryu's* region 26, because the concentration of *Ryu's* p-well 20 may be e.g., 10^{16} cm^{-3} and the concentration of *Ryu's* region 26 may be $5x10^{17}$ cm^{-3}.

However, *Ryu* describes that the region 26 may have a carrier concentration of from about 10^{15} to about $5x10^{17}$ cm^{-3} (see col. [0041]) and the p-well 20 have a carrier concentration of from about 10^{16} to about 10^{19} cm^{-3} (see col. [0044]). In other words,

Ryu only specifies the range of the concentration of each of the p-well 20 and the region 26 separately. There is no disclosure (or suggestion) about any relation between the concentrations in the p-well 20 and in the region 26. Moreover, there is no disclosure (or suggestion) about any relation between the concentration in a specific portion (e.g., an outermost surface portion) of the p-well 20 and the concentration in the region 26. Further, in order to establish an anticipation rejection, the prior art must either inherently or explicitly disclose the claimed invention. In the present case, it is just as likely that the concentration of p-well 20 be higher than region 26, precluding the application of this reference in a 102 rejection.

In contrast, claim 1 recites that the impurity concentration in the outermost surface portion of the impurity region is controlled to be lower than a first-conductivity impurity concentration in the epitaxial layer.

Further, there are many problems when an accumulation layer is formed by a separate epitaxial growth after the formation of the impurity region (see the specification, paragraph [0035]) or formed by a separate high-concentration ion implantation on the impurity region (see the specification, paragraph [0036]). In contrast, in claim 1, because the concentration of the epitaxial layer is higher than that of the outermost surface portion of the impurity region, the first conductivity appears in the outermost surface portion of the impurity region (see the specification, paragraph [0024], line 6). Further, because the impurity region has a relatively low impurity concentration at the outermost surface portion, carriers moving in the channel region (i.e., the outermost surface portion) are less liable to be scattered (see the specification, paragraph [0023], line 10). Thus, the claimed relation between the concentrations of

the impurity region and the epitaxial region makes it possible to form an accumulation layer 31 (see the specification, paragraph [0024], and Applicant's Figure 3), which does not require the conventional method for forming the accumulation layer.

It is thus submitted that claim 1 is *prima facie* patentably distinguishable over the cited reference. It is requested that this claim be allowed, and the rejection be withdrawn.

The Examiner has further rejected claims 3 and 5 as being anticipated by *Ryu*, and further rejected claim 4 as being obvious over *Ryu* in view of *Lee* (US 2004/0159886). Claim 3 has been amended to incorporate claim 4. Applicant will treat the Examiner's rejection of claim 4 as pertaining to claim 3 and claim 5 dependent therefrom. These claims are patentably distinguishable over the cited references for at least the following reasons.

Claim 3 is directed to a semiconductor manufacturing method. Claim 3 recites that a surface portion of a silicon carbide semiconductor epitaxial layer is doped with an impurity of a second conductivity by single-step ion implantation in the impurity region forming step. As acknowledged by the Examiner, *Ryu* does not teach the single-step ion implantation as recited in claim 3.

The Examiner further relies on *Lee* in rejecting the claims. *Lee* describes that the first and second impurity regions can be concurrently formed using a single step ion implantation process (see Lee, paragraph [0016]). More specifically, the ion implantation process for forming *Lee*'s first impurity region 55 may be omitted, and thus *Lee*'s first impurity region 55 (i.e., the source region) and second impurity region 57 (i.e., drain region) may be concurrently formed using only a single step ion implantation

process (see paragraph [0061], Figure 10A). Accordingly, *Lee*'s single step ion implantation process is a process to form two separate regions that are spaced apart from each other.

In contrast, in claim 3, the single-step ion implantation is performed to form a single area, i.e., the impurity region. As described in the specification, at paragraph [0004], the claimed single ion implantation into the impurity region is an implantation performed with constant implantation energy (see Figure 2), whereas the conventional multi-step ion implantation is performed with several different levels of implantation energy (see Figure 7). Thus, the claimed single step ion implantation is an implantation using a single energy level for implantation of a single region, rather than an implantation for multiple regions at the same time.

It is thus submitted that claim 3, and claim 5 depending therefrom, are *prima facie* patentably distinguishable over the cited references. It is requested that these claims be allowed, and the rejections be withdrawn.

Claims 6 and 7 have been added, which are supported by the specification, paragraph [0024], and Applicant's Figure 3. Claims 6 and 7 depend respectively from independent claims 1 and 3, and thus these claims are *prima facie* patentably distinguishable over the cited references for at least the same reasons as claims 1 or 3, as well as the additional features recited therein. It is requested that these claims be allowed.

It is submitted that this application is in condition for allowance. Such action and the passing of this case to issue are requested.

Should the Examiner feel that a conference would help to expedite the prosecution of the application, the Examiner is hereby invited to contact the undersigned counsel to arrange for such an interview.

An extension fee is submitted herewith. Should any additional fees be required, the Commissioner is hereby authorized to charge such fees to our deposit account No. 18-0002, and advise us accordingly.

Respectfully submitted,

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Date

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